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【646】Cavity-mediated fermionization of long-range interacting bosons

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We investigate and compare few-particle one-dimensional bosonic and fermionic gases with infinite-range interactions induced by a laser-driven dissipative optical cavity by computing density distributions and correlation functions. With increasing cavity-atom coupling, both types of gases self-organize into a one-dimensional lattice structure with different site occupations. As the cavity-mediated light-matter interactions are increased further, the bosons progressively occupy the outer lattice sites and eventually completely localize into highly-correlated single-particle states. At this stage, the correlation functions and density fluctuations of the bosonic gas are indistinguishable from the fermionic ones. We comment on the interplay between contact and cavity-mediated interaction on the emergence of fermionization. Finally, we suggest experimental regimes where our theoretical findings could be tested.

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